DOI:
10.1097/RLU.0000000000001974

Document Version
Peer reviewed version

Clinical Nuclear Medicine

F-18-FDG PET/CT detected delayed endoleak in an aorto-iliac endovascular aneurysm repair (EVAR)

--Manuscript Draft--

Manuscript Number:	CNM-D-17-00916R1
Full Title:	F-18-FDG PET/CT detected delayed endoleak in an aorto-iliac endovascular aneurysm repair (EVAR)
Article Type:	Interesting Image
Keywords:	F-18-FDG PET/CT; EVAR; angiogram; endoleak; abdominal aortic aneurysm; diagnosis
Corresponding Author:	Byung Jin Kim, BA University of Oxford Oxford, Oxfordshire UNITED KINGDOM
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	University of Oxford
Corresponding Author's Secondary Institution:	
First Author:	Byung Jin Kim, BA
First Author Secondary Information:	
Order of Authors:	Byung Jin Kim, BA
	Kevin M Bradley, FRCP, FRCR
	Manil Subesinghe, MRCP, FRCR
Order of Authors Secondary Information:	
Abstract:	We present a case of a type Ia endoleak detected by F-18-FDG PET/CT 10 years following an abdominal aorto-iliac EVAR in an 83-year-old man. The F-18-FDG PET/CT scan was performed to evaluate a solitary pulmonary nodule but in addition demonstrated unexpected blood pool activity outside of the stent graft and within the abdominal aortic aneurysm (AAA) sac, indicating an endoleak; no FDG activity should be present within the aneurysm sac following stent graft placement. A subsequent CT angiogram confirmed the endoleak. This case illustrates the value of PET/CT in unexpectedly demonstrating this serious, late complication of EVAR.

F-18-FDG PET/CT detected delayed endoleak in an aorto-iliac endovascular aneurysm repair (EVAR).

Authors

Byung Jin Kim, BA (Hons), Medical Sciences Division, John Radcliffe Hospital, OX3 9DU

Kevin M Bradley, FRCP, FRCR, Department of Radiology, Churchill Hospital, Oxford, OX3 7LE

Manil Subesinghe, MRCP, FRCR, Department of Radiology, Churchill Hospital, Oxford, OX3 7LE

Correspondence

Byung Jin Kim, BA (Hons), Medical Sciences Division, John Radcliffe Hospital, OX3 9DU

Email: byungjin.kim@ccc.ox.ac.uk

Short title

PET/CT detected delayed endoleak

Conflicts of Interest

None

F-18-FDG PET/CT detected delayed endoleak in an aorto-iliac endovascular aneurysm repair (EVAR).

Abstract

We present a case of a type Ia endoleak detected by F-18-FDG PET/CT 10 years following an abdominal aorto-iliac EVAR in an 83-year-old man. The F-18-FDG PET/CT scan was performed to evaluate a solitary pulmonary nodule but in addition demonstrated unexpected blood pool activity outside of the stent graft and within the abdominal aortic aneurysm (AAA) sac, indicating an endoleak; no FDG activity should be present within the aneurysm sac following stent graft placement. A subsequent CT angiogram confirmed the endoleak. This case illustrates the value of PET/CT in unexpectedly demonstrating this serious, late complication of EVAR.

Key words

F-18-FDG PET/CT, EVAR, angiogram, endoleak, abdominal aortic aneurysm, diagnosis

Figure Legend

An 83-year-old man underwent a whole-body F-18-Fludeoxyglucose (FDG) PET/CT scan to characterise/stage an enlarging 1.4cm pulmonary nodule. As well as demonstrating the pulmonary nodule, the PET/CT scan revealed blood pool activity extending for approximately 7 cm within the left side of the original large AAA sac (**A coronal, B axial; standard routine non-contrast PET images acquired at 90 minutes; SUV 0-6 scale; arrows to abnormal, extraluminal blood pool activity; C corresponding unenhanced axial CT image from PET/CT**), which had undergone an abdominal aorto-iliac EVAR ten years previously. The left iliac limb was known to be chronically occluded, and had been successfully treated by a femoral-femoral crossover graft. The abnormal activity was localised to within the aneurysm sac and outside of the EVAR stent graft. A CT angiogram was performed (**D and E**) and confirmed there was an active, type Ia endoleak.[1] The patient underwent open aortic neck banding but subsequently deceased due to pneumonia.

Endoleak is a unique complication of EVAR, caused by non-resolving pressure on the aneurysmal sac and it remains a significant problem in approximately 25% of patients, who have undergone EVAR to treat AAA[2] with most endoleaks occurring in the first 30 days post-EVAR[3, 4]. A type 1 endoleak results from blood entering the aneurysm sac from an attachment site with consensus suggesting that this occurs in approximately 7.5% of procedures.[5] Type 1a is from the proximal attachment site. Endoleak predisposes to post-operative morbidities, including aneurysmal sac expansion and subsequent rupture, making identification and treatment important.[6, 7] Various methods of investigation exist to monitor for endoleaks, including magnetic resonance angiography and duplex ultrasound with or without contrast. However, the gold standard to detection remains multiphase CT angiography.[7]

Increased FDG uptake involving the aortic wall, resulting from inflammation, has been suggested to be a predictor for an endoleak and AAA rupture risk.[8] Recently, early, dynamic PET/CT and PET angiography for endoleak detection after EVAR has been proposed[9] although is only likely to find utility

if intravenous contrast is contraindicated. Given the increasing use of endovascular techniques for the repair of AAA, with their associated endoleaks, the recognition of delayed endoleaks, outside of routine CT surveillance programmes, on PET/CT scans performed for other indications is of critical importance.

References

1. Bashir MR, Ferral H, Jacobs C, et al. Endoleaks after endovascular abdominal aortic aneurysm repair: management strategies according to CT findings. *AJR Am J Roentgenol*. 2009;192:W178-186.

2. White SB, Stavropoulos SW. Management of Endoleaks following Endovascular Aneurysm Repair. *Semin Intervent Radiol*. 2009;26:33-38.

3. Shah A, Stavropoulos SW. Imaging Surveillance following Endovascular Aneurysm Repair. *Semin Intervent Radiol*. 2009;26:10-16.

4. Liaw JV, Clark M, Gibbs R, et al. Update: Complications and management of infrarenal EVAR. *Eur J Radiol.* 2009;71:541-551.

5. Veith FJ, Baum RA, Ohki T, et al. Nature and significance of endoleaks and endotension: summary of opinions expressed at an international conference. *J Vasc Surg.* 2002;35:1029-1035.

6. Tornqvist P, Resch T. Endoleaks after EVAR and TEVAR: indications for treatment and techniques. *J Cardiovasc Surg (Torino)*. 2014;55:105-114.

7. Avgerinos ED, Chaer RA, Makaroun MS. Type II endoleaks. *J Vasc Surg*. 2014;60:1386-1391.

8. Paraskevas KI, Tzovaras AA, Stathopoulos V, et al. Increased fluorodeoxyglucose uptake following endovascular abdominal aortic aneurysm repair: a predictor of endoleak? *Open Cardiovasc Med J*. 2010;4:117-119.

9. Drescher R, Guhne F, Freesmeyer M. Early-Dynamic Positron Emission Tomography (PET)/Computed Tomography and PET Angiography for Endoleak Detection After Endovascular Aneurysm Repair. *J Endovasc Ther.* 2017;24:421-424.